

Heraclides Of Pontus | Encyclopedia.com

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(*b.* Heraclea Pontica [now Ereğli, Turkey], ca. 390 B.C.: *d.* Heraclea Pontica, after 339 B.C.),

astronomy, philosophy

Heraclides, son of Euthyophron, came from a noble and wealthy family of Heraclea Pontica, a Greek city on the south coast of the [Black Sea](#). He traced his descent from one of the original founders of Heraclea. His birthdate can be inferred approximately from his relationship to various members of the Academy and from his statement that the destruction of the city of Helice in Achaëa by an earthquake (373 B.C.) took place in his lifetime.¹ He came to Plato's Academy in the charge of Heraclides when he went to Sicily.² Although counted as one of Plato's pupils (Heraclides himself said that Plato sent him to Colophon to collect the poems of Antimachus), he was apparently more closely associated with Speusippus, Plato's successor as head of the Academy. He also attended Aristotle's lectures.

Upon the death of Speusippus (339 B.C.), Heraclides was one of the candidates to succeed him, but Xenocrates won by a few votes, whereupon Heraclides returned to his native city, where he died some time later. The attempts to establish a *terminus post quem* for his death from his alleged mention of the cult of Sarapis³ or of his pupil Dionysius⁴ are unconvincing. Two different stories are connected with his death. According to one account, Heraclea was afflicted by a famine and sent envoys to the Delphic oracle to ask what to do. Heraclides bribed the ambassadors and the Pythia to pretend that the god had replied that the city would be relieved if Heraclides were honored with a gold crown while alive and a hero's cult after death. During the ceremony of bestowing the crown in the theater, Heraclides died of a stroke (or fell and hit his head on a step according to another version). The other account is even more implausible: Heraclides raised a tame snake and persuaded a friend to substitute the snake for his body when he died, so that people would think that he had become a god. Both stories may have been invented to match Heraclides' well-attested penchant for tall tales and his pretensions. We are told that he dressed richly, was very fat and stately, and was nicknamed Pompikos by the Athenians ("Stately, magnificent") instead of Pontikos.

Heraclides' many books were greatly admired in antiquity both for style and content. Not a single work has survived, and of most we know only the title. Many of them were in the form of dialogues, as was common practice in the Academy. The subjects, which were very influential (for example, Heraclides' contribution to the legend of Pythagoras), they do not concern us here. A number of his works belong to a group called *φυσικά*, which is best translated "on the nature of things." These works too cannot be considered scientific but belong to the kind of pre scientific speculation that characterized most early Greek philosophy. The following are some examples: each of the stars is a world of its own: the moon is earth surrounded by mist; and a comet is a high cloud reflecting light.⁵ Heraclides' work "On Diseases" was more concerned with thaumaturgy (for example, a woman who lay apparently dead for seven days and was restored to life) than with medicine, to judge from the surviving fragments.⁶

In modern times Heraclides is famous chiefly for an astronomical theory that has been attributed to him, namely that the orbits of Venus and Mercury have the sun as their center, while the sun in turn moves around the earth. Although there is no good reason to believe that Heraclides proposed such a theory, the attribution has become so much the received opinion that the theory commonly goes under the name of "the system of Heraclides Ponticus," and Heraclides is variously considered a precursor of [Tycho Brahe](#), Aristarchus, or Copernicus. It is therefore appropriate to give some account, not only of the ancient evidence on the subject, but also of the numerous modern misunderstandings of that evidence.

The theory was indeed held in antiquity, but the contexts in which it occurs show that it arose at a much later stage of Greek astronomy, for reasons which were not operative at the time of Heraclides. We must start from Ptolemy's discussion of the order of the planets in *Almagest* IX, 1. He says there⁷ that while all agree that all the planets lie between the sun and the fixed stars and that Mars, Jupiter, and Saturn lie (in ascending order) beyond the sun, there is disagreement about the position of Venus and Mercury. The "older astronomers" placed them below the sphere of the sun, while some of the later astronomers put them above the sphere of the sun. Ptolemy's account is fully confirmed by our fragmentary sources for pre-Ptolemaic astronomy.⁸ It seems likely that the hypothesis that the orbits of Venus and Mercury encircle the sun (and that thus the two planets are sometimes above and sometimes below the sun) was introduced as a third choice. Moreover it seems highly probable that it was introduced after the development of the epicycle theory, according to which the mean motions of the sun, Venus, and Mercury are identical, that is, the centers of their epicycles lie on the same straight line. This is the form in which it is found in our most explicit source, The On of Smyrna,⁹ who says that according to this theory the epicycles of the sun, Venus, and Mercury have a common center. Thus the theory can hardly predate 200 B. C. Of the three sources who mention the theory only one, Macrobius, attributes it to a specific authority, namely "the Egyptians."

The only astronomical doctrine of Heraclides for which there is solid evidence is the rotation of the earth on its axis. This is attested by a number of sources,¹⁰ from which it is abundantly clear that Heraclides proposed that the earth lies in the center of the universe and turns on its axis once a day. This is a simple variation of the common belief, canonized in Ptolemaic astronomy, that the earth is central and stationary, while the whole heavens revolve once a day. In *Almagest* I, 7, Ptolemy argues against the rotation of the earth (on purely physical grounds).¹¹ Although he mentions no names, it appears that the doctrine was fairly common. Heraclides is the earliest philosopher who is known beyond question to have held this opinion.¹² Unfortunately certain ambiguous expressions in the ancient descriptions of Heraclides' doctrine have misled some modern scholars into thinking that he held that the earth moves in a circular orbit (see below on Schiaparelli and Van der Waerden). Examination of all the evidence shows that this is wrong.¹³

The only evidence concerning Heraclides' opinion on Venus is a passage of the commentary on Plato's *Timaeus* by Calcidius (fifth century A.D.) which I translate as follows:

Finally Heraclides Ponticus, when he drew the circle of Venus, and also [the circle] of the sun, and assigned a single center to both circles, showed that Venus is sometimes above, sometimes below the sun. For he says that the sun and moon and Venus and all the planets, wherever each of them is, are [each] indicated by a single line drawn from the center of the earth through the center of the heavenly body. So there will be one line drawn from the center of the earth indicating the sun, and two other lines drawn to left and right of it, fifty degrees from the sun and a hundred degrees from each other. The eastern from the sun toward the east, and therefore has the name [evening star](#) ("Hesperus") because it appears in the east [sic] in the evening after sunset. The western line [indicates Venus] when it is at greatest distance from the sun toward the west and therefore is called the morning star ("Lucifer"). For it is obvious that it is called [evening star](#) when it is seen in the east [sic] following sunset, and morning star when it sets before the sun and rises again before the sun when the night is almost over.¹⁴

Seizing on the remark that Venus is "sometimes above, sometimes below the sun," modern scholars have concluded that Heraclides believed that the orbit of Venus (and, by analogy, that of Mercury) encircles the sun. The first to draw this conclusion was T. H. Martín's in 1849.¹⁵ Schiaparelli not only accepted Martín's conclusion¹⁶ but even conjectured that Heraclides proposed the Tychonic theory, in which the orbits of all the planets encircle the sun, which in turn revolves about the central earth.¹⁷ Since there is not a scrap of evidence that anyone in antiquity proposed the Tychonic theory, discussion of the point is idle. Schiaparelli further suggested that Heraclides anticipated Aristarchus in proposing a heliocentric system as at least a theoretical possibility.¹⁸ The basis for this is the following passage in Simplicius, quoting Geminus (first century A.D.): "So someone comes forward and says [Heraclides Ponticus] that if the earth moves in a certain way and the sun stands still, the apparent anomaly of the sun can be represented."¹⁹ The words "Heraclides Ponticus" are an intrusion into the syntax and sense of the sentence, and are obviously interpolated by a reader who wanted to explain the "someone," as was remarked by Tannery.²⁰ We can be sure that the interpolator, no doubt misled by the doxographical tradition that Heraclides assumed the axial rotation of the earth, was in error.

Yet another theory was attributed to Heraclides by van der Waerden,²¹ according to which the sun, Venus, and the earth (in ascending order) all revolve around a common center. This is based largely on misinterpretation of diagrams in the manuscripts of Calcidius, explaining the maximum elongations of Venus from the sun according to the epicycle theory. In any case, it is flatly contradicted by the unanimous testimony that Heraclides put the earth in the center of the universe.

Although Calcidius was a bungler and certainly did not read Heraclides' work,²² what he says in the passage translated above makes reasonable sense. It is an explanation of the fact that Venus appears as both a morning and evening star.²³ The sun and Venus both move on circles with the earth as "a single center." If one draws lines from that center to the sun and Venus, one finds that the line earth-Venus is sometimes to the left (to the east) of the line earth-Sun, and sometimes to the right (to the west). The only phrase inconsistent with this is the statement that Venus is "sometimes above, sometimes below the sun." If we interpret "above" and "below" to mean, not "farther from and nearer to the earth," but "to the west" and "to the east" of the sun, the inconsistency is removed. This was suggested by G. Evans²⁴ and was confirmed by O. Neugebauer, who pointed out that Calcidius' "superior/inferior" is simply a translation of the Greek *ἀνωτέρωρον/κατώτέρωρον* which are found in works on "spherics" with exactly the meaning required here.²⁵ Thus the whole basis for attributing to Heraclides the theory that Venus revolves around the sun vanishes, and so does the influence on the development of ancient astronomy, which has often been attributed to him in modern times. Heraclides' only claim to a place in the history of astronomy is his assertion authorities for this in Copernicus' *De revolutionibus*.²⁶

NOTES

1. Strabo, *Geography*, VIII, 384 (Wehrli, *Herakleides Pontikos*, fr.46a).

2. Suidas, s.v. (Wehrli, fr.2). If true, this must refer to Plato's third Sicilian journey (probably in 360 B.C.). The whole of "Suidas'" account, however, inspires little trust.

3. Plutarch, *Isis and Osiris*, 361e (Wehrli, fr.139). Even if one emends the MS reading "Heraclitus" to "Heraclides," Plutarch may be referring to a later period. "Heraclides Ponticus," a grammarian of a later period. Furthermore, the date of the foundation of the cult of Sarapis is greatly disputed.

4. Wehrli, fr.12, with commentary on 62.
5. *Ibid.*, frs. 113a-b, 114a-c, 116.
6. *Ibid.*, 76-89.
7. Heiberg, ed., *Syntaxis mathematica*, 11, 206-207.
8. For details, see O. Neugebauer *A History of Ancient Mathematical Astronomy*, 11, 647-650, 690-693.
9. Theon of Smyrna, *Expositio rerum mathematicarum*..., Hiller, ed., 186-187. Of the other two sources, Macrobius, *Commentarii in Somnium Scipionis*, 1. 19, 5-6, gives the same version in cruder language: while Maritianus Capella, VIII, 857, simply says that Venus and Mercury have “the sun” as the center of their circles.
10. Wehrli, frs. 104-108.
11. Heiberg, ed., 24-26.
12. It is also ascribed to the obscure figure of “the Pythagorean Ecphantus” (Wehrli, fr.104). In the 5th century B.C. Philolaus of Crotona had constructed a theory in which the earth not only rotates but moves about “the central fire”; this seems, however, to have been inspired more by mystical speculation than by astronomical considerations (see Kurt von Fritze, *Dictionary of Scientific Biography*, X. 589-591).
13. Best demonstrated by A. Pannekoek, “The Astronomical System of Heraclides,” 375-379.
14. Calcidus, *Timaeus a Calcidio*..., CX, Waszink, ed., 157. The crucial first sentence is “Denique Heraclides Ponticus, cum circulum Luciferi describeret, item solis, et unum punctum atque unam medietatem duobus daret circulis, demonstravit ut interdum Lucifer superior, interdum inferior sole fiat.”
15. In his edition of Theon of Smyrna, 120, 426-428. Elaborated in *Mémoires de l' Académie des inscriptions et belles-lettres*, 30, pt. 2 (1883). 21-43.
16. Schiaparelli, “I precursori Copernico,” 401-408.
17. Schiaparelli, “Origine del sistema eliocentrico,” esp. 165-166.
18. *Ibid.*, 163-164.
19. Wehrli, fr.110. On the date of Geminus, which is often wrongly stated to be the first century B.C., see Neugebauer, *History of Ancient Mathematical Astronomy*, 11, 579-581.
20. *Mémoires scientifiques*, IX, 255-258. Elaborated by Heath, Aristarchus, 275-283.
21. “Die Astronomie des Herakleides von Pontos”: repeated in “Die Astronomie der Pythagoreer,” 62-73.
22. Since much of what Calcidus says about astronomy is almost identical to passages in Theon of Smyrna, who is avowedly drawing on a certain Adrastus, it is likely that Adrastus in Calcidus’ source here as elsewhere.
23. The discovery that the morning star and evening star are the same body was attributed to Pythagoras, but Heraclides may still have needed to explain it in the 4th century B.C.
24. Evans. *The Astronomy of Heraclides Ponticus*, “esp. 110-111.”
25. Neugebauer, “On the Allegedly Heliocentric Theory of Venus,” “referring to Theodosius (1st century B.C.).”
26. Zeller, ed., IV, 14.

BIBLIOGRAPHY

The chief for Heraclides’ life and works is his biography in Diogenes Laërtius, *Lives of the Philosophers*, V, 86-91 (Leipzig, 1884), 246-248. Like all of Diogenes’ biographies, this is a mixture of puerile anecdotes and sound information derived from excellent authorities; it includes a list of the titles of Heraclides’ works. The fragments relating to the life and works have been

collected in Fritz Wehrli, *Herakleides Pontikos*, 2nd ed. (Stuttgart, 1969), which is *Die Schule des Aristoteles*, vol. VII. Wehrli also provides a useful commentary (somewhat muddled on astronomical matters), and should be consulted for further bibliography (esp. 57).

The astronomical theory, wrongly attributed to Heraclides, is in Theon of Smyrna, *Expositio rerum mathematicarum ad legendum Platonem utilium*, E.Hiller, ed. (Leipzig, 1878), 186-187; in Macrobius, *Commentarii in Somnium Scipionis*, I, 19, 5-6, J.Willis, ed (Leipzig, 1973), 74; and in [Martianus Capella](#), *De nuptiis philologiae et Mercurii*. VIII. 857, A.Dick, ed. (Leipzig, 1925), 450-451. Ptolemy's discussion of the order of the planets is in *Syntaxis mathematica*, J. L. Heiberg, ed., 2 vols. (Leipzig 1898-1903), which is *Claudii Ptolemaei opera quae estant omnia*, I, IX, 1, Vol. 2, 24-26. An extensive discussion of the ancient evidence on this topic is in O. Neugebauer, *A History of Ancient Mathematical Astronomy*, Studies in the History of Mathematics and the Physical Sciences, no. 1, 3 vols. ([New York](#), 1975), II, 694-696.

The passage of Calcidius referring to Heraclides is *Timaeus a Calcidio translatus commentioque instructus*, J. H. Waszick, ed., which is *Plato Latinus*, IV (London-Leiden, 1962), Commentarius CX, p. 157. It was first interpreted as making Venus's orbit heliocentric by T. H. Marin, in his edition of part of Theon of Smyrna, *Theonis Smyrnaei liber de astronomia* (Paris, 1849; repr. Groningen, 1971), 120-121, 426-428. See also T.H. Maritn, "Mémoire sur l'histoire des hypotheses astronomiques chez les Grecs et Romains," in *Mémoires de l'Académie des inscriptions et belles-lettres*, 30 pt. 2 (1883), 1-43; and Giovanni Schiaparelli, "I precursori Copernico nell' antichità," in his *Scritti sulla storia della astronomia antica*, I (Bologna, 1925), 363-458, originally published in *Memorie dell' Istituto lombardo di scienze e lettere*, 12 (1873). Schiaparelli developed his further hypotheses in "Origine del sistema planetario eliocentrico presso i Greci," in *Scritti...*, II (Bologna, 1926), 115-177, originally published in *Memorie dell' Istituto lombardo di scienze e lettere*, Classe di scienze matematiche e naturali, 3ed ser., 18 (1896-1900), 61-100. This was refuted by Paul Tannery, "Sur Héraclide du Pont," in *Revue des études grecques*, 12 (1899), 305-311, repr. in his *Mémoires scientifiques*, IX, J. L. Heiberg, ed. (Toulouse-Paris, 1929), 252-259.

A good account of the ancient evidence and modern discussions is T. L. Heath, [Aristarchus of Samos](#) (Oxford, 1913; repr., Oxford, 1959), 249-283. B. L. van der Heraklides von Pontos, "in *Stizungsberichte de Sächsischen Akademie der Wissenschaften zu Leipzig*, Math-naturwiss. Kl., 96 (1944), 47-56, and repeated it (within a greatly expanded reconstruction of Pythagorean astronomy) in "Die Astronomie der Pythagoreer" *K.Verhandelingen der Nederlandse akademie van wetenschappen, Afd. Natuurkunde*, ser. A, 20 no. I (1951). He was refuted by A. Pannekoek. "The Astronomical System of Herakleides," *Ibid.*, ser B, 55, no. 4 (1952), 373-381. Godfrey Evans, "The Astronomy of Heracleides Ponticus," in *Classical Quarterly*, n.s. 20 (1970), 102-111, although occasionally confused and ignoring much of the modern literature, was the first to give a correct explanation of the Calcidius passage. A similar explanation, with the crucial terminological evidence, was given independently by O. Neugebauer, "On the Allegedly Heliocentric Theory of Venus by Heraclides Ponticus," in *American Journal of Philology*, 93 (1972), 600-601. See also his *A History of Ancient Mathematical Astronomy*, II ([New York](#), 1975), 694-696.

Copernicus refers to Herachides in *De revolutionibus orbium caelestium*, F. and C. Zeller, eds. (Munich 1949), which is *Nikolaus Kopernikus Gesamtausgabe*, vol. II in the Dedicatory Epistle, p. 5, and IV, p. 14.

G. J. Toomer